

REMARKS

The Official Action rejects each of the elected claims under 35 U.S.C. § 103(a) as being unpatentable over a combination of references. As described below, independent Claims 1 and 18 have been amended in order to further highlight the patentable distinctions between the method and apparatus of the claimed invention and the cited references, taken either individually or in combination. As a result of these amendments, Claims 2 and 3 have been canceled and dependent Claim 19 has been amended. Additionally, Claims 10 and 12 have been rewritten in independent format, and dependent Claim 11 has been amended accordingly. In view of the foregoing amendments and the subsequent remarks, Applicants respectfully request reconsideration of this application and allowance of the claims.

The method for detecting an abnormality in a host medium set forth by amended independent Claim 1 defines a two-stage process. In the first stage, the host medium is illuminated at a plurality of different positions, signals are detected following propagation of the signals through the host medium and any abnormality within the host medium, and a shadow image is created based upon the detected signals in which the abnormality is depicted as a suspicious region. As now amended, the signals with which the host medium is illuminated in this first step are defined to be frequency-swept modulated signals. In the second step, at least that portion of the host medium that contains the suspicious region is again illuminated with frequency-swept modulated signals, the frequency-swept modulated signals are detected following propagation through at least that portion of the host medium that contains the suspicious region and the abnormality is subsequently characterized based upon the signals are frequency-swept modulated across a larger range of frequencies during the illumination of the suspicious region, i.e., during the second step, than during the initial illumination of the host medium.

None of the cited references, taken either individually or in any combination, teach or suggest the method of amended independent Claim 1. In this regard, the only reference that discusses the modulation of the amplitude or intensity of a signal at a frequency that varies is the Essenpreis '352 patent. However, the Essenpreis '352 patent describes only a single step process

in which the scattering medium is interrogated with signals having an intensity that varies at a frequency that is modulated. The Essenpreis '352 patent in no way describes a two-step detection process in which a host medium is initially interrogated to create a shadow image and any suspicious region detected within the shadow image is then further interrogated with frequency-swept modulated signals as recited by amended independent Claim 1.

The Official Action does cite the Ning '565 patent for the proposition that a detection process can initially be conducted at a lower resolution and then at a higher resolution in order to focus on suspicious lesions. However, the Ning '565 patent does not teach or suggest interrogating the lesions with any type of frequency-swept modulated signal, either initially or subsequently. Even if it were argued that the Essenpreis '352 patent could be combined with the Ning '565 patent to describe a two-step process in which the medium was interrogated with frequency-swept modulated signals first over a broader area and then in a more concentrated fashion near suspicious lesions, the combination of these references does not teach or suggest the further recitation now recited by amended independent Claim 1 in that the signals are frequency-swept modulated across a larger range of frequencies during the illumination of the suspicion region, i.e., during the second illumination step, than during the initial illumination of the host medium. In this regard, the Ning '565 patent does not describe frequency-swept modulation at all, and the Essenpreis '352 patent does not provide many details regarding the frequency range across which the signals are swept and, in any event, does not describe the relationship of any ranges over which signals are frequency-swept during initial and subsequent illumination steps as now recited by amended independent Claim 1.

As noted above, Claim 10 has been amended and is now presented in independent form. Independent Claim 10 also includes the two-step process in which a shadow image is initially created and a suspicious region within the shadow image is then further illuminated with frequency-swept modulated signals in order to better characterize the abnormality. As now recited, during the illumination of the suspicious region, i.e., during the second illumination step, a light source that is capable of emitting light that propagates in a first direction is positioned at a position offset from the suspicious region in a direction transverse to the first direction. With

reference to Figure 4 of the patent application, for example, the light source may be positioned so as to emit light that propagates in the direction indicated by the downwardly directed arrow that impacts the upper plate 12. This light source is displaced or offset from the suspicious region in a direction transverse to the direction in which the light is propagating, that is, in a direction parallel to the plates 12. None of the cited references, taken either individually or in combination, teach or suggest a light source offset in this manner during a second illumination step in which frequency-swept modulated signals interrogate the suspicious region. In fact, Applicants submit that such an offset design may be counterintuitive as one might initially believe it best to align the light source with the suspicious region in order to obtain the desired results. Applicants submit, however, that such an offset relationship as now recited by amended independent Claim 10 may be desirable in at least some embodiments and further assist in characterization of the abnormality.

As also noted above, Claim 12 has been rewritten in independent form and again describes the two-step process in which a shadow image is initially generated and a suspicious region that is identified therein is further interrogated. In this regard, amended independent Claim 12 recites that the light source and detector that are employed during the illumination of the suspicious region, i.e., during the second illumination step, are on opposite sides of the host medium and in an offset relationship and out of alignment with one another. The light source and detector are then moved in tandem such that this offset relationship is maintained. With reference to Figure 6 of the present application, for example, the light source is represented by the incoming arrows directed toward the upper plate 12 and the detector is represented by the outgoing arrows exiting from the lower plate 12. As shown, the light source/detector pair is offset and therefore out of alignment with one another as now recited by amended independent Claim 12. None of the cited references, taken either individually or in combination, teach or suggest such an offset and misaligned relationship as now recited by amended independent Claim 12. In fact, Applicants submit that the offset relationship recited by amended independent Claim 12 may be counterintuitive as one might initially think that the placement of the light source and detector in an aligned relationship would provide the best result. Applicants believe,

however, that for at least some embodiments, the offset relationship described by amended independent Claim 12 may improve the characterization of the abnormality.

Amended independent Claim 18 defines an apparatus for detecting an abnormality in the host medium in which the detection occurs in essentially a two-stage process. In this regard, the apparatus of amended independent Claim 18 includes a light source for generating signals that propagate in a first direction and illuminate the host medium at a plurality of different positions, a modulator for applying frequency-swept modulation to the signals generated by the light source prior to illuminating the host medium, a detector for detecting the signals following propagation through the host medium and the abnormality within the host medium and a display for presenting a shadow image based upon the detected signals in which the abnormality is depicted as a suspicious region. The apparatus of independent Claim 18 also includes a positioner for positioning the light source relative to the host medium such that the light source illuminates the host medium at a plurality of different positions. In this regard, the positioner is recited to initially position the light source at a plurality of different positions that cover a broad portion of the host medium to facilitate generation of the shadow image. The positioner subsequently positions the light source proximate that portion of the host medium that includes the suspicious region so as to facilitate characterization of the abnormality. As now recited, the positioner also positions the detector relative to the host medium. In this regard, the positioner is capable of positioning the light source proximate the suspicious region, but in an offset relation in a direction transverse to the first direction from the detector and/or the suspicious region.

As described above in conjunction with amended independent Claims 10 and 12, this offset relationship between the light source and at least one of the detector and the suspicious region facilitates the further interrogation of the suspicious region and may serve to better characterize the abnormality. As also described above in conjunction with amended independent Claims 10 and 12, none of the cited references, taken either individually or in combination, teach or suggest any such offset relationship and Applicants further submit that common sense may actually dictate against such an offset relationship.

For at least the reasons described above, the cited references, taken either individually or in combination, do not teach or suggest the method and apparatus of amended independent Claims 1, 10, 12 and 18. As such, Applicants submit that the rejection of these claims is therefore overcome.

The dependent claims include each of the recitations of a respective independent claim. As such, the dependent claims are also patentably distinct from the cited references, taken either individually or in combination, for at least the same reasons as described above in conjunction with the amended independent claims. However, a number of the dependent claims include additional recitations that are further patentably distinct from the cited references.

By way of example, dependent Claim 23 further recites that the apparatus includes an adjustable belt extending between the plates proximate the breast and capable of being tightened such that the breast fills the region defined by the pair of plates and the adjustable belt. In conjunction with dependent Claim 23, the Official Action notes that the references do not explicitly disclose such a belt, but takes official notice that "using an adjustable belt to tighten two plates around the breast is well-known in the art". Applicants note that Claim 23 does not recite an adjustable belt that is tightened around the two plates as indicated by the Official Action, but, instead, an adjustable belt that extends between the plates proximate the breast. As such, none of the references, and no combination of the references, teach or suggest this additional feature. Thus, Applicants submit that the rejection of dependent Claim 23 is overcome for this additional reason. If the Examiner continues to reject this claim, however, Applicants respectfully request the citation of a patent, publication or other reference in support of the rejection as opposed to reliance upon official notice.

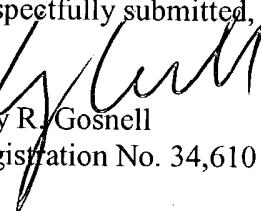
CONCLUSION

In view of the amendments and the remarks presented above, it is respectfully submitted that all of the claims of the present application are in condition for immediate allowance. It is therefore respectfully requested that a Notice of Allowance be issued. The Examiner is

Appl. No.: 09/531,262
Filed: March 17, 2000
Office Action of May 19, 2004
Amendment of November 19, 2004
Page 15

encouraged to contact Applicants' undersigned attorney to resolve any remaining issues in order to expedite examination of the present application.

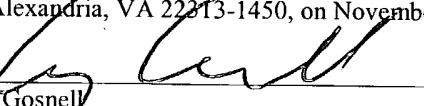
It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

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CLT01/4681626v1